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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003904359 for a patent by CTECH EQUIPMENT PTY. LTD as filed on 15 August 2003.

I further certify that the above application is now proceeding in the name of CTECH CLOSURES PTY LTD pursuant to the provisions of Section 113 of the Patents Act 1990.



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Twelfth day of August 2004

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**IMPROVEMENTS RELATING TO A TAMPER EVIDENT RING
FOR A CONTAINER CLOSURE AND CONTAINER NECK WITH
CORRESPONDING ANNULAR TAMPER BEAD**

This invention relates to a tamper evident ring for a container closure and a container neck. In particular it relates to a ring which is intended to be retained on a container neck when the container closure has been removed.

A known design of tamper evident ring includes a plurality of frangible connections initially joining the ring to the container closure, and a plurality of solid radial ramp projections to engage behind an annular tamper bead on the container neck. When the closure is removed for the first time, the projections engage the annular tamper bead to retain the ring on the neck, thus causing the frangible connections between the ring and the closure to become severed. The ramp shape of the projections is intended to allow the ring -to be fitted easily on to the rim, but not easily removed.

However, a problem with this design is achieving reliability in use. Typically, this sort of ring might be about 80% reliable. If the projections are too small, the ring will be not retained securely on the neck, and it might remain intact with, or at least partly intact with, the closure when the closure is removed for the first time. Besides it being inconvenient for a user to have to separate the ring from the closure manually once the closure has been removed, this also means that the ring cannot give a guaranteed tamper-proof indication.

However if the projections are large to ensure that the ring will be retained reliably on the neck, it can then be difficult to fit the ring initially on the neck without risking damage to some of the severable connections.

Prior art (AU 701668) teaches us the use of a second means of engagement between the protrusions on the annular tamper band on the closure and protrusions on the neck of the container (i.e. neck protrusions other than the tamper bead on the neck of the container) such that this second means of engagement between the tamper ring and the container prevents unscrewing movement of the tamper ring greater than one half turn of rotation whereupon the said secondary engagement means becomes effective and further rotation to remove the closure causes the severing of the frangible attachments between the annular tamper band and the skirt of the cap.

With the majority of sealing methods the interaction between the closure means and the container neck occurs over a very small axial distance such that one half turn of the closure in the direction of removal, would remove the sealing means from juxtaposition with the container neck thereby allowing atmosphere and potential contaminants to enter into the container even though the tamper ring on the closure has not been broken.

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There is also the need for either designing the frangible connections with a cross section to impart sufficient strength to withstand the rigours of cap sorters and application onto the container but yet be sufficiently frangible to allow removal by persons of limited strength in hands and or wrists. The present invention has been devised with the above problems in mind, and with the particular aim of providing an improved design of tamper evident ring.

In a first non limiting aspect the invention provides a tamper evident ring and a corresponding container neck for a container closure assembly consisting:

a container neck with an annular tamper bead having on it or depending from it or commencing below it at least one protrusion ramped or tapered in such direction to minimise friction between the neck and the closure during application of the closure and shaped so as to present an angled surface to engage with a corresponding angled surface on the annular tamper ring on the closure and alternatively but not limiting the scope of the invention:-

a container neck with at least one protrusion ramped or tapered in such direction to minimise friction between the neck and the closure during application of the closure but shaped as to present an angled surface to engage with a corresponding angled surface on the annular tamper ring on the closure. The container neck having a retention bead in the vicinity of the lower end of the protrusion angled to co-operate with a corresponding retention means on the annular tamper ring on the closure

such that rotation motion to remove the closure causes engagement of the co-operating angled surface or surfaces on the neck of the container and the tamper ring on the closure such that further unscrewing movement creates both lateral and axial stress on the frangible connections between the annular tamper ring and the skirt causing separation of the tamper band from the closure.

The number of the protrusions or angled ramps on the container may be less than or equal to or more than the number of corresponding openings or protrusions on the closure tamper ring. The positioning and numbers of the protrusions or angled ramps on the container in relation to the corresponding openings or protrusions on the closure tamper ring may include the notion of sequential engagement between the protrusions or angled ramps on the container and the corresponding openings or protrusions on the closure tamper ring such that the frangible connections trend to be or are severed sequentially so as to minimise the force necessary to sever the frangible connections.

The orientation of the protrusions or angled ramps may be such that the angle may be less than vertical but greater than horizontal.

The configuration of the protrusions or angled ramps may be such that they may also be shaped in such a way or of such dimension as to by engagement

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by some means with a device on the closure tamper ring thereby facilitate a retention means to retain the tamper evident ring on the neck of the container.

A closure consisting of :

- a) a top disc portion which may exhibit various sealing means on the inside thereby engaging one or more of the inside of the neck, the uppermost portion of the neck and the outside of the container neck and
- b) a depending skirt with internal thread or thread sections corresponding with the threaded container neck and
- c) an annular tamper evident ring frangibly depending from the skirt
 - i) with one or more protrusions so ramped or shaped as to present less resistance upon application of the closure and shaped so that upon unscrewing movement engagement occurs with the underside of the tamper bead on the container neck thus preventing removal of the tamper band and
 - ii) one or more openings or ramped protrusions or combination thereof which are ramped or shaped so that upon application they minimise resistance thereby facilitating application without damaging the frangible connections between the tamper band and the cap skirt and which upon unscrewing of the cap will present a least one

surface to engage one or more of the protrusions on the tamper bead on the neck of the container and upon further unscrewing movement the respective angles of the engaged surfaces translate the unscrewing movement into an axial movement which promotes separation of the tamper ring from the skirt. The number of openings or protrusions on the closure tamper ring may be less than or equal to or more than the protrusions or angled ramps on the container neck. The positioning and numbers of the openings or protrusions on the closure tamper ring in relation to the corresponding protrusions or angled ramps on the container neck may in one no limiting embodiment of this invention include the notion of sequential engagement between the protrusions or angled ramps on the container and the corresponding openings or protrusions on the closure tamper ring such that the frangible connections tend to be or are severed sequentially so as to minimise the force necessary to sever the frangible connections.

The present invention also extends to an alternate system whereby the concept of protrusions engaging protrusions may be in at least one instance replaced with channels or recesses co-operating with protrusions.

In another non-limiting embodiment of present invention also extends to removal of the tamper bead retaining ring located above the angled protrusions on the neck of the container and or addition/location of a retaining

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ring below the angled protrusions on the neck of the container so as to retain the tamper ring on the container as evidence of opening or tampering

In an alternate non limiting embodiment the present invention extends to the protrusions on the tamper ring of the closure being not angled so that the face meets a correspondingly angled face but instead being vertical. That is the ramped protrusion on the neck of the container is not vertical but the engagement face on the corresponding protrusion on the closure tamper ring is vertical.

In an alternate non limiting embodiment of the invention the engagement face of the protrusion on the tamper ring is shaped so as to create an angle of less than 90 degrees to the wall of the tamper ring. This angled concept may also apply to protrusions or ramped angle protrusions on the neck of the container.

The present invention also extends in a non limiting manner to any one or more of the foregoing aspects combined with one or more of the following:-

various child resistant features one of which may be of the type whereby it is necessary to exert downward force either on the top of the closure or on the top of an over-cap which fits over the top of the closure, such that the downward force overcomes resistance thereby allowing engagement means between the over-cap and the closure to enable removal rotation of the closure to operate the tamper evident feature and remove the closure from the neck of the container.

The concept of moulding the closure from more than one type of material. For example it would assist recycling if the closure tamper ring was moulded in the same material as the container.

Various dispensing means such as, but not limited to, a flexible membrane with cruciform or other pattern slits or openings to thereby permit the dispensing of container contents or a pump action dispenser or a push/pull valve closing/ opening feature.

A closure applied by axial rather than rotational motion.

A closure with cooperating ratchet or engagement means between the skirt of the closure and the tamper ring such that co-operation between the said means or any of them on the skirt and the tamper ring tends to prevent rotational force on the tamper ring during application from severing the frangible bridges connecting the tamper ring to the skirt of the closure.

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Various means of employing an additional foil seal to ensure freshness of the contents of a container and which may include a means to pierce the foil.

Utilising a closure with tabs or projections extending inward towards the neck of the container and in one non limiting embodiment, also extending upwards to engage the tamper bead on the container neck but also to be shaped so as the leading edge of at least one tab on removal rotation engages with a angled face means on the container neck

The present invention also extends in a non limiting manner to any one or more of the foregoing aspects combined.



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